BROOKHAVEN
NATIONAL LABORATORY

HYDRANT FLOW TEST ANALYSIS REPORT 2005

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FIRE PROTECTION ENGINEERING GROUP

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2 FOREWORD

The scope of this document is to present the water flow test results that have been collected over the week of July 11 of 2005 by Fire Fighters and the summer interns in Fire Protection Engineers Group at Brookhaven National Laboratory. Observations, work that requires further study and recommendations for improvements are presented.

The author wants to recognize the following people for their input in creating this document.

Sean Vaz, Summer Student Intern

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John Searing, Emergency Services

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BNL Firefighters

3 TEST RESULTS

Annually Emergency Services conducts flow tests to determine the available pressure/flow capacities at 23 test sites around BNL. During the week of July 11 Fire Fighters and the summer interns in Fire Protection Engineers Group at Brookhaven National Laboratory conducted the 23 annual flow tests and 14 gradient flow tests. A detailed trend analysis of each test site along with a rated score for pipe condition and flow capacity is provided. The 2005 Site Water Distribution Analysis Report has determined that the overall condition of the piping has not changed substantially.

3.1 FORMAT OF TEST DATA SHEETS

Each of the 23 Test Data Sheets consists of the following information:

- Title
- Site Map
- Symbol List
- MEFF & Risk Categories
- Summary Table
- Three Graphs
- Description
- Analysis

In order to understand how the ratings and analysis were formulated an understanding of the development of three sections of information need to be discussed. The three sections are: Fire Flow & Risk Categories, the "Summary Table" and the three graphs.

3.1.1 DESCRIPTION OF FIRE FLOW AND RISK CATEGORIES

Each of the 23 water flow test points have a fire flow and ratings assign to four risk categories as shown below. Each risk category is rated with either a low, moderate or high concern classification based on specific criteria for each of the risks.

MEFF 1,500 GPM	OCCUPANCY ORDINARY HAZARD	PIPING CONDITION POOR	FLOW CAPACITY LIMITED	PIPING NETWORK MULTIPLE PATHS

3.1.1.1 MAXIMUM EXPECTED FIRE FLOW (MEFF)
Maximum Expected Fire Flow (MEFF) value represents the estimated fire fighter flow necessary to attack the largest realistic fire in the area. There are several recognized mathematical models that determine the MEFF for a building/area. For this study the BNL Fire Chief and the senior BNL fire protection engineer determined the minimum gallons per minute (GPM) flow. The criteria used to determine the values is a combination of the size of the assets being protected, the criticality of the area/buildings to BNL operations, building construction, proximity of building structures, and the amount of automatic sprinkler and standpipe systems in use.

3.1.1.2 OCCUPANCY
"Occupancy" rating describes the area to be protected around the test point. The criteria used to determine the rating is a combination of the value of the assets being protected, the criticality of the area/buildings to BNL operations, building occupancy and construction, proximity of building structures, and the amount of automatic sprinkler and standpipe systems in use.

3.1.1.3 PIPING CONDITION
"Piping Condition" rating describes the present condition of the piping. The criteria used to determine the rating is the historical flow trends, the age, and condition of piping materials used. A "GOOD" rating signifies that the available water flow has not decreased for at least a decade and meets MEFF. A "FAIR' or "POOR" rating deals with the severity of the negative flow trend over the testing period and the available flow compared to MEFF.

3.1.1.4 FLOW CAPACITY
"Growth Potential" rating describes the ability of the present piping condition to take on new or shifting domestic demands in the area. The criteria used to determine the rating is the available fire flow at 20 PSI. A "GOOD" rating signifies that the available water flow at 20 PSI is well above the minimum required fire flow for the area. A "LIMITED' or "POOR" rating determines the severity of the difference between the available flow and the MEFF.

3.1.1.5 PIPING NETWORK
"Piping Network" rating describes the configuration of the supply piping to support the test point area. The criteria used to determine the rating is the configuration, condition and ability of the source piping to support the test area

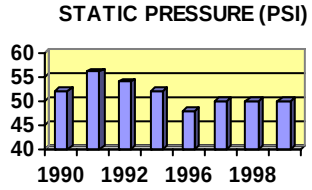
piping. A “MULTIPLE PATH” rating signifies that multiple source paths are available to the test point area piping. A “DEAD END” rating signifies that the source piping to the test point area piping is restricted to a single pipe path.

3.1.2 DESCRIPTION OF THE SUMMARY TABLE

Each of the 23 water flow test points has a statistic summary table as shown below. The table provides a set of calculated values based on the historical test data available at each point. The information presented is averages based on three time periods: Overall, last 10 years, and last 5 years. Average Trend analysis was used in conjunction with the graph data to form the flow and pressure analysis. In some cases a certain year was eliminated from the averages if the test results seemed either too high or low. Eliminated test data for a particular year is noted in the analysis section of the test point page.

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	51.5 PSI	50 PSI	50 PSI
FLOW AVERAGE @ 20 PSI	1536 GPM	1520 GPM	1454 GPM
FLOW CHANGE FROM OVERALL	-	-1.1%	-5.6%

3.1.3 DESCRIPTION OF THE THREE GRAPHS

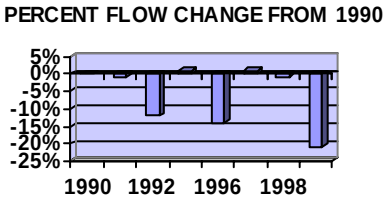


3.1.3.1 STATIC PRESSURE GRAPH

The static pressure graph shows the first piece of information to complete a water flow test. A pressure reading is made at the designated pressure hydrant with no flow at the designated flow hydrant. The hydrant locations are shown on the maps. This pressure reading determines how the piping system interacts with the day to day domestic or mechanical water usage. However another variable exist on the site water mains that can produce swing in pressure readings up to 10 PSI. That variable is the two elevated water tanks. Low elevated tank levels can produce lower static pressures even when the day to day domestic or mechanical water usage has not changed.

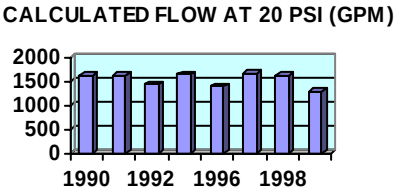
3.1.3.2 CALCULATED FLOW AT 20 PSI GRAPH

The final two pieces of information to complete a water flow test is a pressure reading at the designated pressure hydrant at the same time determining the actual flow at the designated flow hydrant. 20 PSI is the industry recognized minimum pressure on a site water main system for determining adequate fire supplies. In all cases at BNL, we could not produce a flow from a single hydrant that will produce a 20 PSI reading at the pressure hydrant. Therefore we hydraulically calculate the expected flow at the desired pressure minimum 20 PSI hydrant reading. The results of the calculations are represented in this graph.



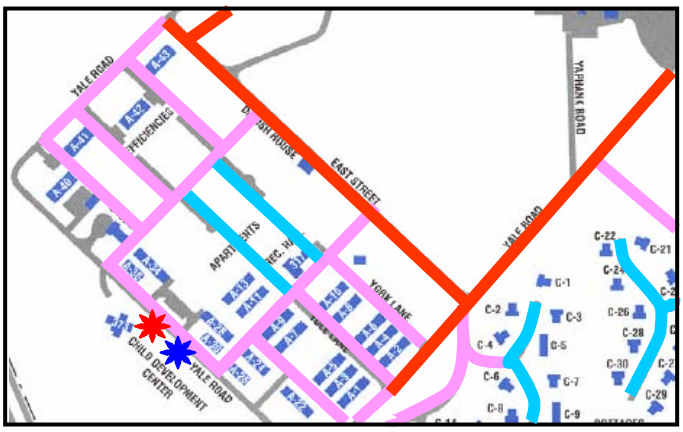
3.1.3.3 PERCENT FLOW CHANGE FROM BASE YEAR GRAPH

The “Percent Flow Change from Base” graph is a subset of information from the “Calculated Flow At 20 PSI” graph. What is represented in the graph is the present change for an individual year as compared with the base year. The base year should always be assumed to be the first year of reading and noted as having 0% change from the base. This graph allows us to analysis trends in the “Calculated Flow At 20 PSI” graph.



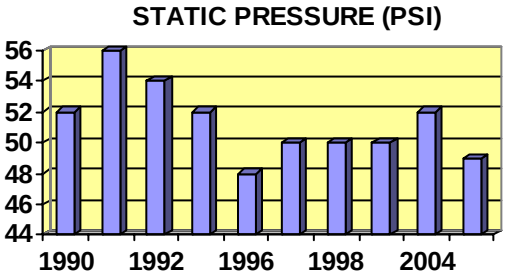
4 TEST DATA SHEETS

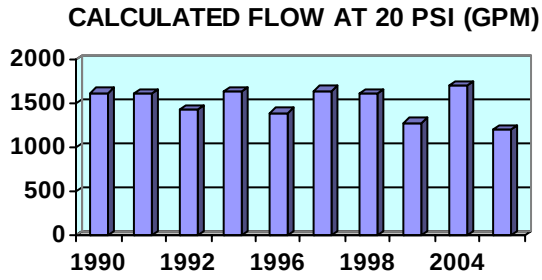
4.1 TEST POINT 1: APARTMENTS

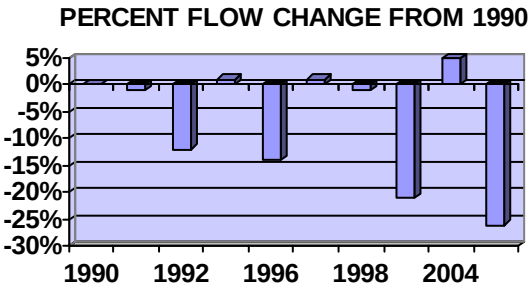


MEFF 1,500 GPM	OCCUPANCY ORDINARY HAZARD	PIPING CONDITION POOR	FLOW CAPACITY POOR	PIPING NETWORK DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	51.3 PSI	48.8 PSI	50.3 PSI
FLOW AVERAGE @ 20 PSI	1520 GPM	1478 GPM	1399 GPM
FLOW CHANGE FROM OVERALL	-	-.2.8%	-8.6%







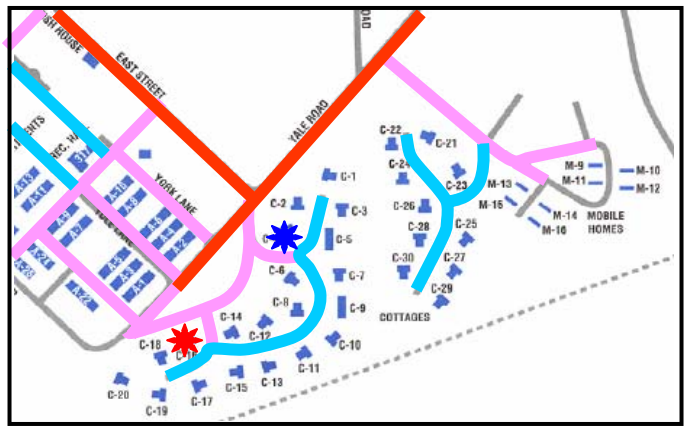
DESCRIPTION

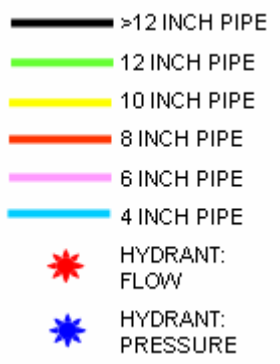
The pressure hydrant was H003 and the flow hydrant H002. This test point is the most hydraulically remote from the supply wells and Water Treatment Facility. The nearest water supply source (300K Tank) is about 5,300 feet away. The local cross mains are less than 8 inch in size. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is a mixture of Cast Iron & Transite Cement Lined piping. The local mains are connected to an 8 inch loop supplied by a 12 inch feed along Upton Ave and two six inch feeds.

ANALYSIS

Static pressures have remained relatively consistent (~51 PSI.) The consistent readings can be attributed to the remoteness of the piping network and the low flow demand for domestic or mechanical usage in the apartments. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
Average flow loss from 1990 has decreased by up to 8.6% and is below 1500 GPM. This flow rate loss can be attributed to the age of the piping and the reliance to the three feeds into the 8 inch loop.
Occupancy is rated "Ordinary Hazard" due to the densely populated wood frame construction buildings.
Piping Condition is rated "Poor" since the flow trend is losing capacity at roughly 8% over the last 15 years.
Flow Capacity is rated "Poor" because of the limited flow at current demand loading through the main piping network and is unable to meet MEFF demands.
Piping Network of water supplies is rated "Dead End" since all water must enter via the isolated 8 inch loop. The two six inch feeds along Princeton Ave. have to be investigated to see if can support the area by themselves.

4.2 TEST POINT 2: COTTAGES

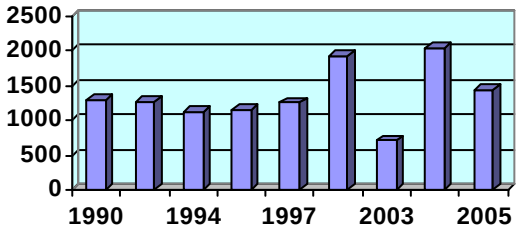




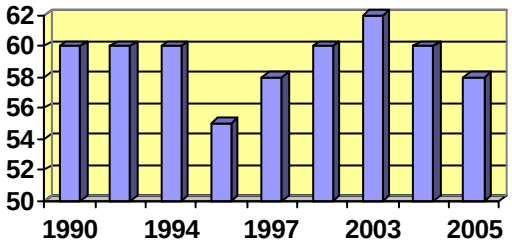
MEFF 1,500 GPM	OCCUPANCY ORDINARY HAZARD	PIPING CONDITION POOR	FLOW CAPACITY POOR	PIPING NETWORK DEADEND

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	59.2 PSI	58.8 PSI	60.0 PSI
FLOW AVERAGE @ 20 PSI	1352 GPM	1418 GPM	1397 GPM
FLOW CHANGE FROM OVERALL	-	4.6%	3.2%

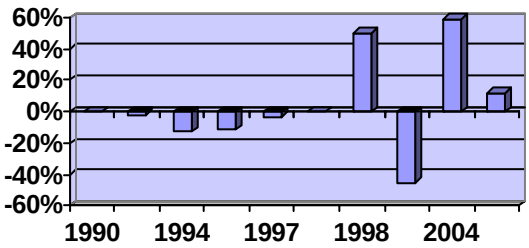
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



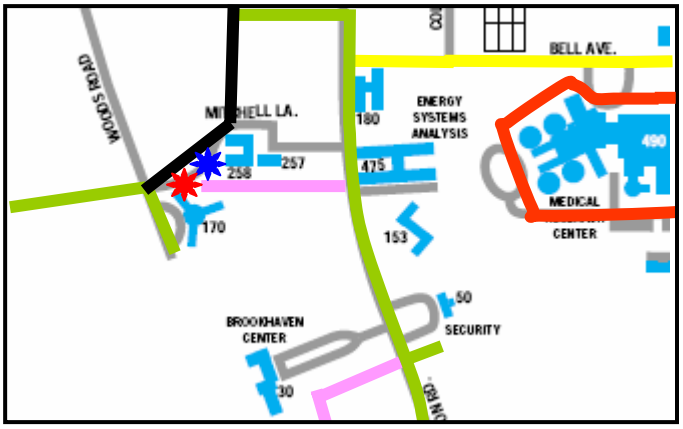
DESCRIPTION

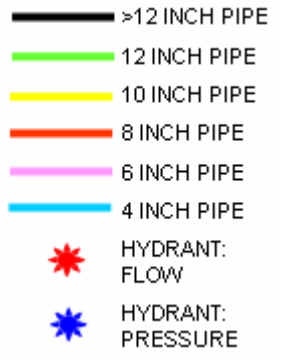
The pressure hydrant was H181 and the flow hydrant H191. The nearest water supply source (300K Tank) is about 4,800 feet away. The local cross mains are less than 8 inch in size. The local mains are connected to an 8 inch loop. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is a mixture of Cast Iron and Transite Cement Lined piping.

ANALYSIS

Static pressures have remained relatively consistent (~60 PSI.) The consistent readings can be attributed to the remoteness of the piping network and the low flow demand for domestic or mechanical usage in the cottages. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The flow for year 1998 was eliminated from analysis since it does not fall within the expected range as compared to the other test points. The available flow average is below 1400 GPM. The flow loss has exceeded 4% since 1990. This flow rate loss can be attributed to the age of the piping and the reliance to the three feeds into the 8 inch loop.
Occupancy is rated “Ordinary Hazard” due to the densely populated wood frame construction buildings.
Piping Condition is rated “Poor” since the flow trend is losing capacity.
Flow Capacity is rated “Poor’ because of the limited flow at current demand loading through the main piping network and is unable to meet MEFF demands
Piping Network of water supplies is rated “Dead End” since all water must enter via the isolated 8 inch loop. The two six inch feeds along Princeton Ave. have to be investigated by hydraulic modeling to see if can support the area by themselves.

4.3 TEST POINT 3: GUEST HOUSE / CURIE- WOMEN'S RESIDENCE

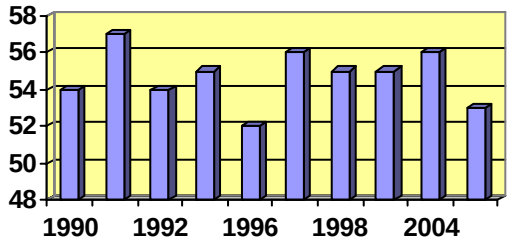




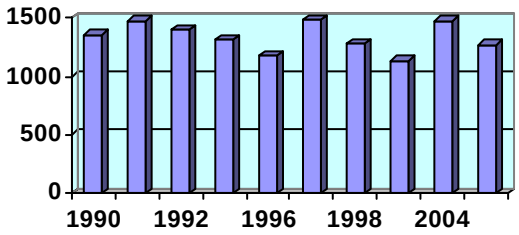
MEFF 750 GPM	OCCUPANCY LOW HAZARD	PIPING CONDITION FAIR	FLOW CAPACITY LIMITED	PIPING NETWORK DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	54.7 PSI	54.5 PSI	54.6 PSI
FLOW AVERAGE @ 20 PSI	1338 GPM	1305 GPM	1295 GPM
FLOW CHANGE FROM OVERALL	-	-2.5%	-3.3%

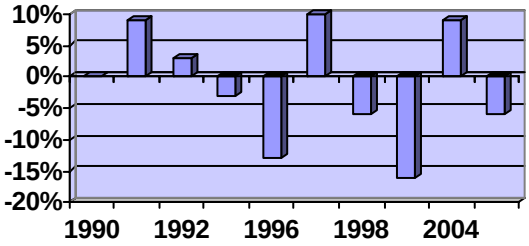
STATIC PRESSURE (PSI)



CALCULATED FLOW AT 20 PSI (GPM)



PERCENT FLOW CHANGE FROM 1990



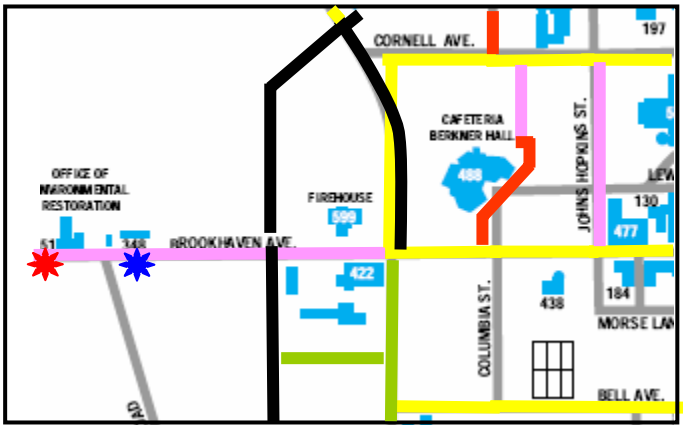
DESCRIPTION

The pressure hydrant was H059 and the flow hydrant H163. The nearest water supply source (300K Tank) is roughly 1,100 feet away. The local branch main is 6 inch in size. The local mains are connected to the 12 inch feed along Upton Ave. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is Transite Cement Lined piping

ANALYSIS

Static pressures have remained relatively consistent (~54 PSI.) The consistent readings can be attributed the low flow demand for domestic or mechanical usage in the residences. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is about 1300 GPM which is the worst on the site. Average flow loss from 1990 has decreased by up to 3%. This flow rate loss can be attributed to the age and size of the piping.
Occupancy is rated "Low Hazard" due to the limited fire loading in the area.
Piping Condition is rated "Fair" since the flow trend is losing capacity at roughly 3% over the last 15 years.
Flow Capacity is rated "Limited" because of the limited flow at current demand loading through the piping network.
Piping Network of water supplies is rated "Dead End" since it gets the majority of water from the 300K storage tank located in close proximity to the hydrants. It will have to be investigated by hydraulic modeling to see if by eliminate the 300K storage tank as a source that the Residences will have adequate flow and pressure.

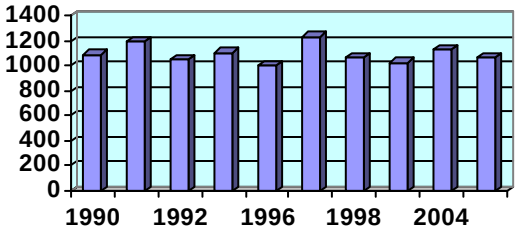
4.4 TEST POINT 4: WEST BROOKHAVEN AVENUE



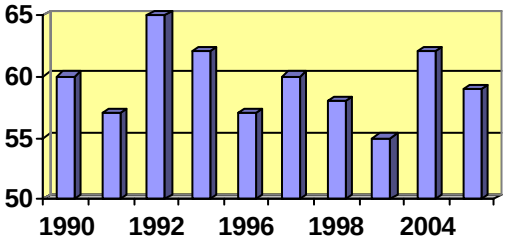
MEFF 1,000 GPM	OCCUPANCY HIGH HAZARD	PIPING CONDITION FAIR	FLOW CAPACITY POOR	PIPING NETWORK DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	59.5 PSI	58.5 PSI	58.7 PSI
FLOW AVERAGE @ 20 PSI	1097 GPM	1087 GPM	1074 GPM
FLOW CHANGE FROM OVERALL	-	-0.9%	-2.1%

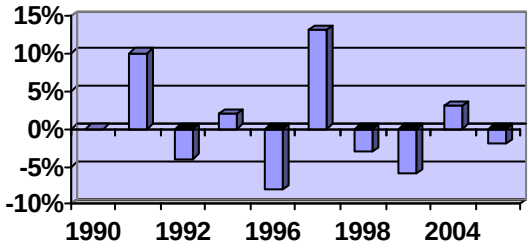
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



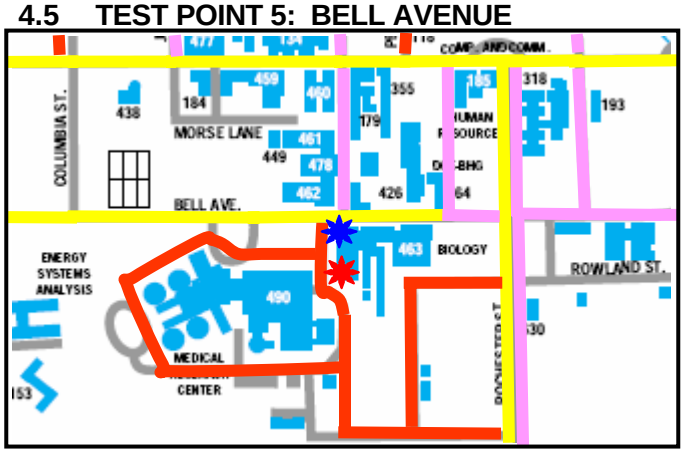
DESCRIPTION

The pressure hydrant was H041 and the flow hydrant H042. The nearest water supply source (Water Treatment Facility) is roughly 1,200 feet away. The local branch main is 6 inch in size. The local main is connected to the 10 inch feed along Upton Ave. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is Transite Cement Lined piping

ANALYSIS

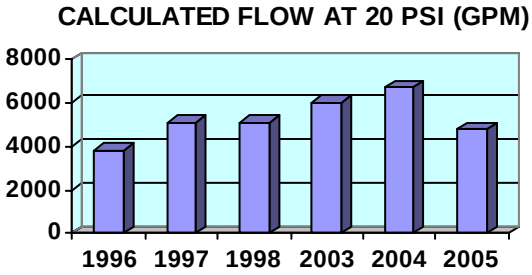
Average static pressures remained relatively consistent (~58 PSI.) .) The consistent readings can be attributed the low flow demand for domestic or mechanical usage in the dead end main. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is now about 1050 GPM. This flow is the worst on the site. Average flow loss from 1990 has decreased by up to 2%. This low flow rate loss can be attributed to the age and size of the piping.
Occupancy is rated "High Hazard" due to Building 348 wood frame with large sources, and close proximity to William Floyd Parkway.
Piping Condition is rated "Fair" since the flow trend is losing capacity at roughly 2% over the last 15 years.
Flow Capacity is rated "Poor" because of the limited flow at current demand loading through the main piping network.
Piping Network of water supplies is rated "Dead End" since it gets water from single line connection

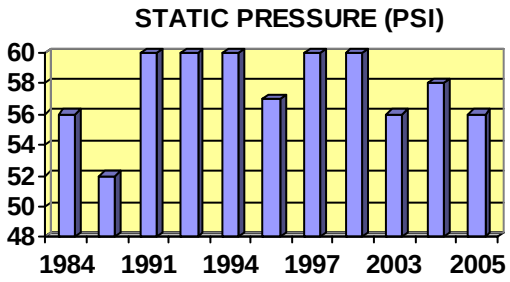
4.5 TEST POINT 5: BELL AVENUE

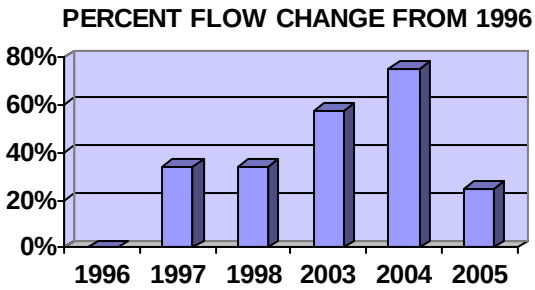


MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
1,000 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	57.73 PSI	57.8 PSI	56.7 PSI
FLOW AVERAGE @ 20 PSI	5258 GPM	5258 GPM	5837 GPM
FLOW CHANGE FROM OVERALL	-	-	9.9%







DESCRIPTION

The pressure hydrant was H069 and the flow hydrant H068. The nearest water supply source (Water Treatment Facility) is about 2,200 feet away. The local mains are a combination of 8 and 10 inch grid piping and were replaced in the mid 1990's with Cement Lined Ductile Iron piping as part of the Bell Avenue project.

ANALYSIS

Static pressures have remained relatively consistent (~57 PSI.) The consistent readings can be attributed the large diameter grid piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

Flow rate analysis is based on tests since 1996 since the piping was modified in the area at that time. The average available flow is about 5800 GPM. Average flow rate from 1996 has increased by up to 10%. This flow rate increase can be attributed to the accuracy of the gauges used and the decrease of domestic and mechanical water demand in the area.

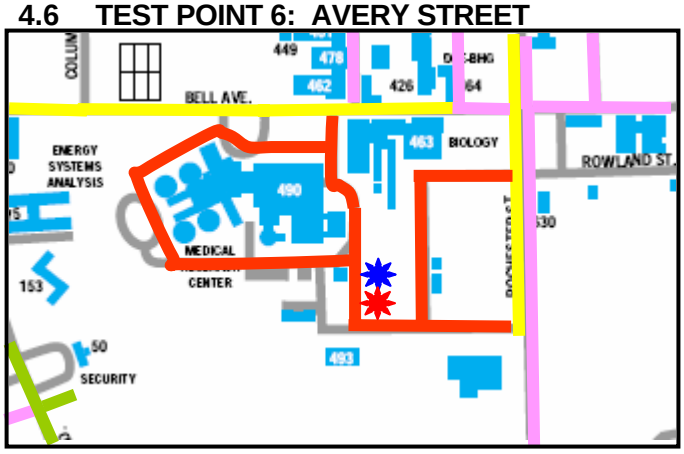
Occupancy is rated "High Hazard" due to use of medical gases, and chemical and biological labs.

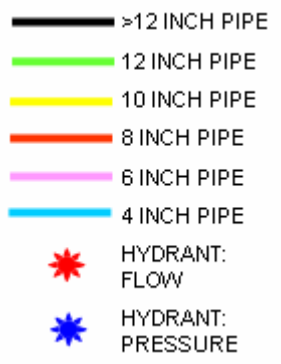
Piping Condition is rated "Good" since the Bell Avenue piping was replaced.

Flow Capacity is rated "Good" because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.6 TEST POINT 6: AVERY STREET

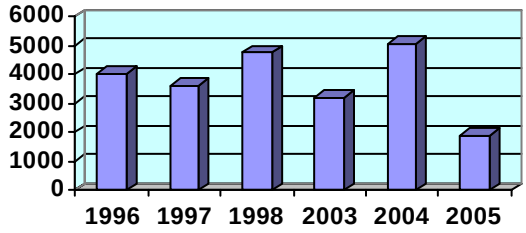




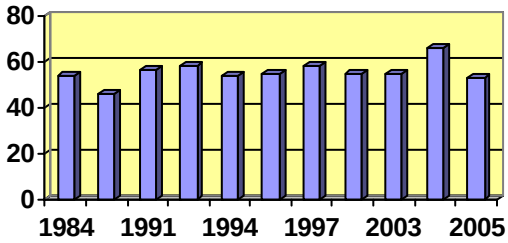
MEFF 2,500 GPM	OCCUPANCY HIGH HAZARD	PIPING CONDITION GOOD	FLOW CAPACITY GOOD	PIPING NETWORK MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	55.5 PSI	57.0 PSI	58.0 PSI
FLOW AVERAGE @ 20 PSI	3761 GPM	3761 GPM	3384 GPM
FLOW CHANGE FROM OVERALL	-	-	11.1%

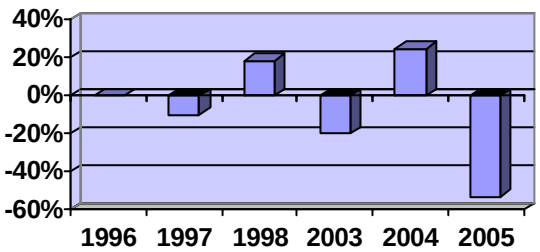
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1996



DESCRIPTION

The pressure hydrant was H067 and the flow hydrant H182. The nearest water supply source (Water Treatment Facility) is about 2,900 feet away. The local mains are 8 inch and were replaced in the mid 1990's with Cement Lined Ductile Iron piping as part of the Bell Avenue project.

ANALYSIS

Static pressures have remained relatively consistent (~55 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

Flow rate analysis is based on tests since 1996 since the piping was modified in the area at that time. The average available flow is about 3300 GPM. Average flow rate from 1996 has increased by up to 11%. This flow rate increase can be attributed to the accuracy of the gauges used and the decrease of domestic and mechanical water demand in the area.

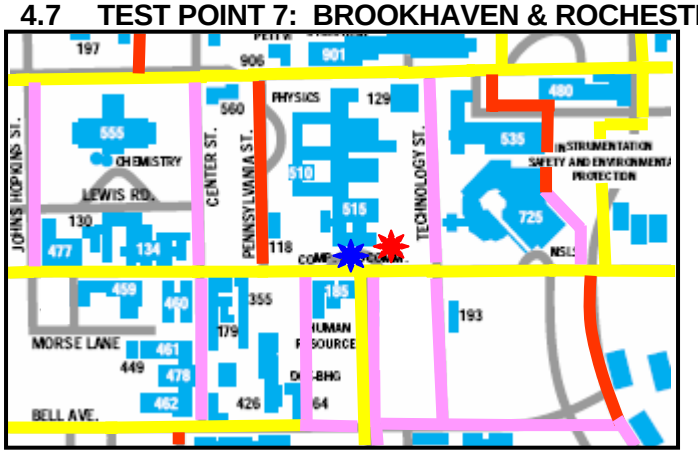
Occupancy is rated "High Hazard" due to large fire loads in storage areas with no automatic sprinkler protection.

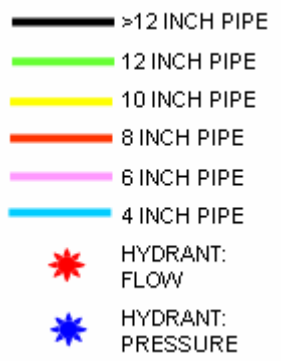
Piping Condition is rated "Good" since the Bell Avenue piping was replaced.

Flow Capacity is rated "Good" because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.7 TEST POINT 7: BROOKHAVEN & ROCHESTER

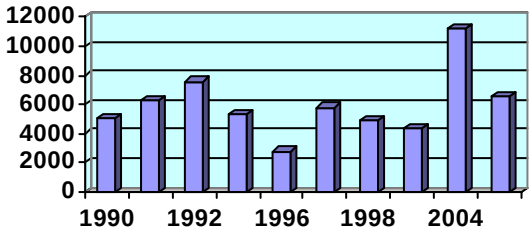




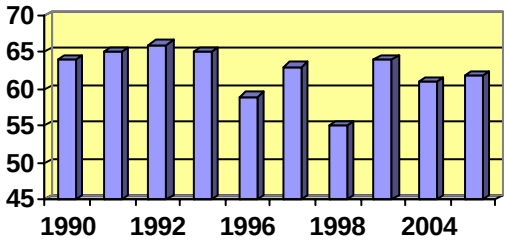
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,000 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	62.4 PSI	60.3 PSI	62.3 PSI
FLOW AVERAGE @ 20 PSI	5987 GPM	5944 GPM	7375 GPM
FLOW CHANGE FROM OVERALL	-	-0.7%	18.8%

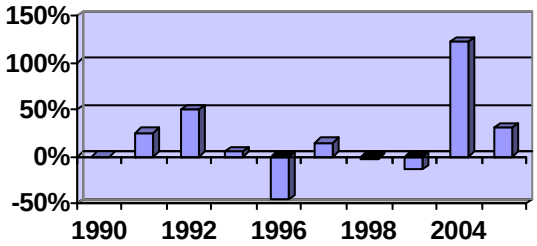
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



DESCRIPTION

The pressure hydrant was H098 and the flow hydrant H097. The nearest water supply source (Water Treatment Facility) is about 2,150 feet away. The local mains are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping in this area is Cement Lined Ductile Iron.

ANALYSIS

Static pressures have remained relatively consistent (~62 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

The average available flow is now about 7375 GPM. Average flow rate from 1990 has increased by 18%. %. This flow rate increase can be attributed to the accuracy of the gauges used and the decrease of domestic and mechanical water demand in the area.

Occupancy is rated "High Hazard" due to large fire loads (multistory offices, basements with flammable gases, wood frame buildings).

Piping Condition is rated "Good" due to an increase in available flow by 18% in the last 10 years.

Flow Capacity is rated "Good" because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since this area can easily get water from multiple sources around the site

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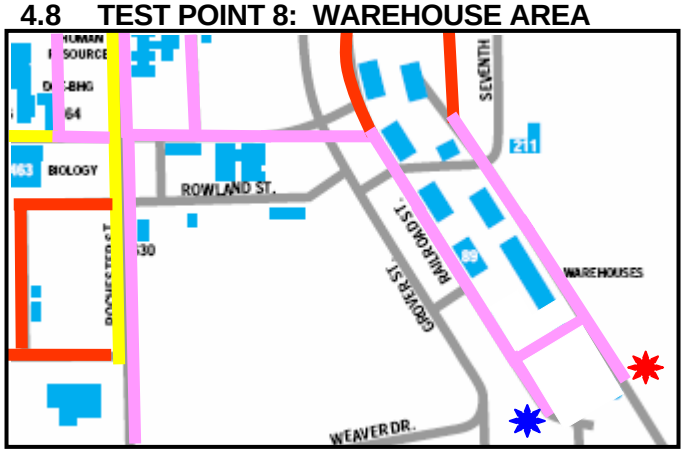
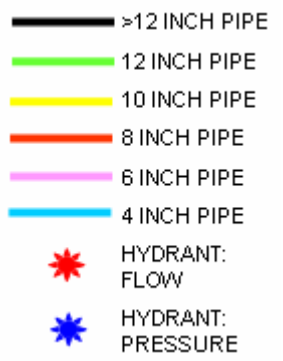
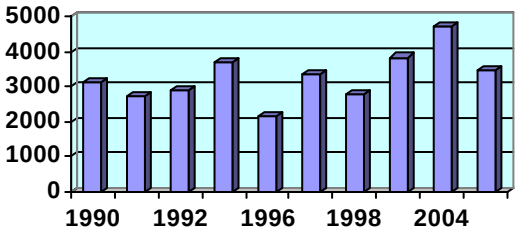
4.8 TEST POINT 8: WAREHOUSE AREA



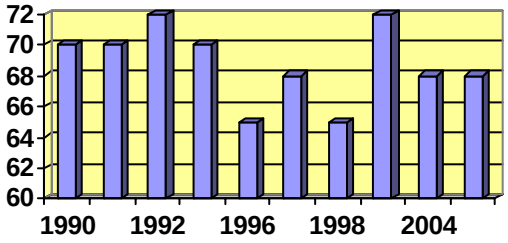


MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
3,000 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

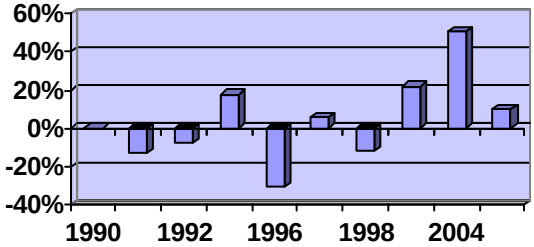
SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	68.8 PSI	67.7 PSI	69.3 PSI
FLOW AVERAGE @ 20 PSI	3281 GPM	3387 GPM	4011 GPM
FLOW CHANGE FROM OVERALL	-	3.1%	18.2%



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



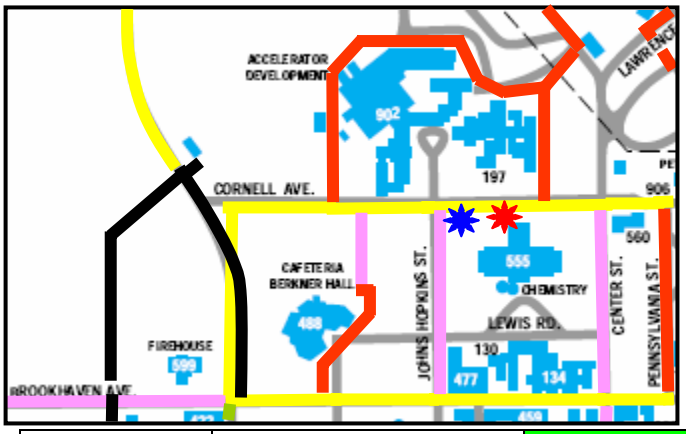
DESCRIPTION

The pressure hydrant was H183 and the flow hydrant H122. The nearest water supply source (Water Treatment Facility) is about 3,900 feet away. The local loop mains are 6 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is Transite Cement Lined.

ANALYSIS

Static pressures have remained relatively consistent (~68 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is now about 3,300 GPM. Average flow rate from 1990 has increased by up to 18%. This flow rate increase can be explained by the decrease of day to day water demand in the area.
Occupancy is rated "High Hazard" due to large fire loads (wood frame warehouse buildings).
Piping Condition is rated "Good" due to an increase in available flow by 18% in the last 5 years.
Flow Capacity is rated "Good" because of the limited flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since the test area can easily get water from multiple sources around the site.

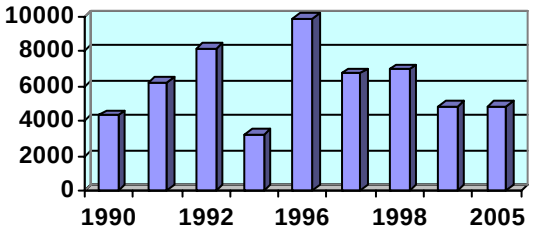
4.9 TEST POINT 9: WEST CORNELL AVENUE



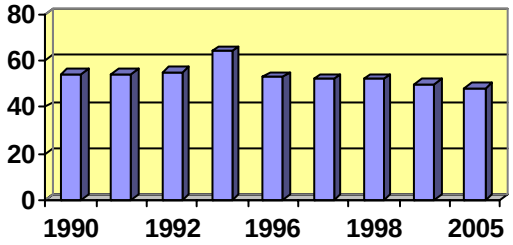
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
5,000 GPM	HIGH HAZARD	GOOD	LIMITED	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	52.3 PSI	51.0 PSI	49.0 PSI
FLOW AVERAGE @ 20 PSI	6119 GPM	6635 GPM	4825 GPM
FLOW CHANGE FROM OVERALL	-	7.8%	-26.8%

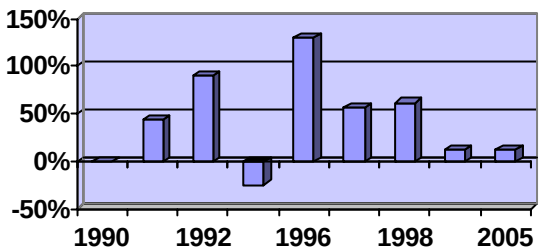
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



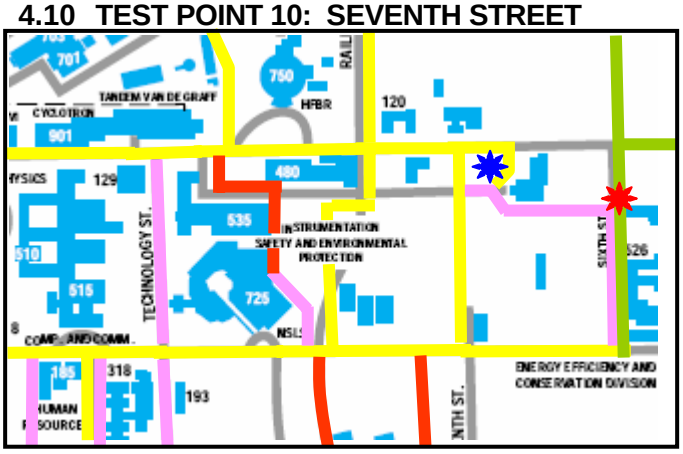
DESCRIPTION

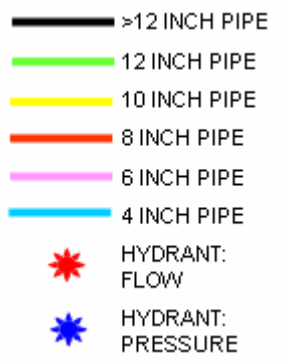
The pressure hydrant was H058 and the flow hydrant H055. The nearest water supply source (Water Treatment Facility) is about 3,000 feet away. The local loop mains are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is over 60 years old. The piping is Transite Cement Lined.

ANALYSIS

Static pressures have remained relatively consistent (~51 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
In the last two years the average available flow is about 4,800 GPM. Average flow rate from 1990 has decreased by up to 26%. This flow rate decrease cannot be determined from available test results. The water supply model seems to support the more recent results than what was recorded earlier than 2004.
Occupancy is rated "High Hazard" due to large fire loads (Chemical Labs, wood frame buildings).
Piping Condition is rated "Good" due to an increase in available flow by 6.6% in the last 15 years.
Flow Capacity is rated as "Limited" because of the limited flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.10 TEST POINT 10: SEVENTH STREET

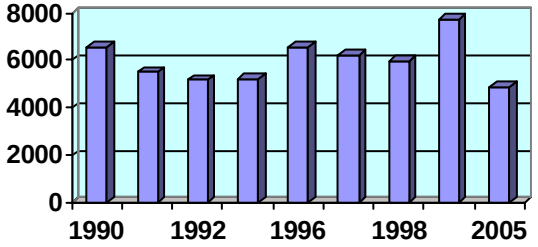




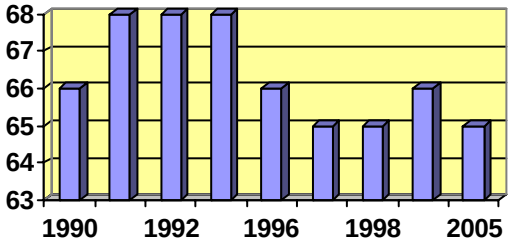
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
5,000 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	66.3 PSI	65.4 PSI	65.5 PSI
FLOW AVERAGE @ 20 PSI	5972 GPM	6262 GPM	6302 GPM
FLOW CHANGE FROM OVERALL	-	4.6%	5.2%

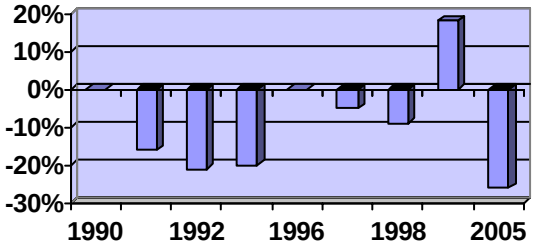
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



DESCRIPTION

The pressure hydrant was H132 and the flow hydrant H133. The nearest water supply source (1,000K Tank) is about 1,800 feet away. The local loop mains are 6 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is overt 60 years old. The piping is Transite Cement Lined.

ANALYSIS

Static pressures have remained relatively consistent (~65 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

The average available flow is about 6,300 GPM. Average flow rate from 1990 has increased by 5%. This flow rate increase can be explained by changes in day to day water demands. The water model supports the current year value and not the previous year results.

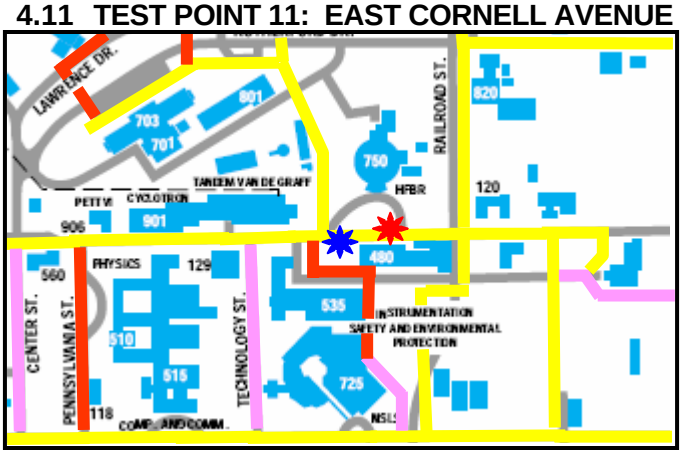
Occupancy is rated "High Hazard" due to large fire loads (fuel oil tank storage, wood frame buildings).

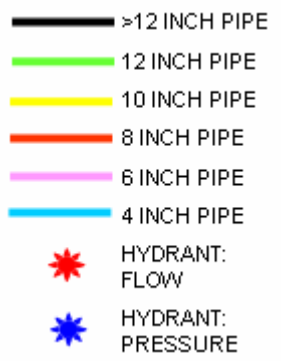
Piping Condition is rated "Good" due to the current year results were close to the water model output for the pressure hydrant. C factor used in model would support a "Good" rating.

Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.11 TEST POINT 11: EAST CORNELL AVENUE

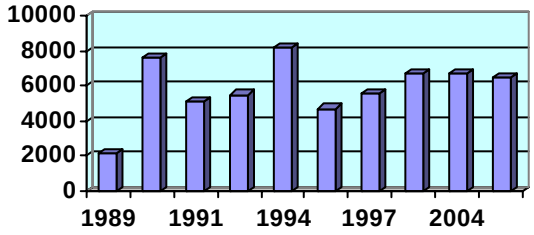




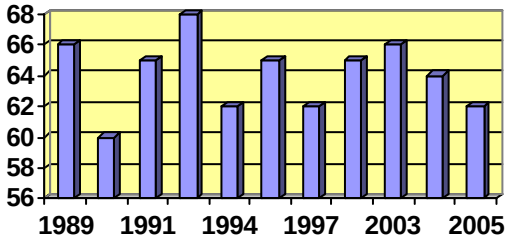
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	64.1 PSI	64.0 PSI	64.0 PSI
FLOW AVERAGE @ 20 PSI w/o 2003 TEST	5866 GPM	6030 GPM	6597 GPM
FLOW CHANGE FROM OVERALL	-	2.7%	11.1%

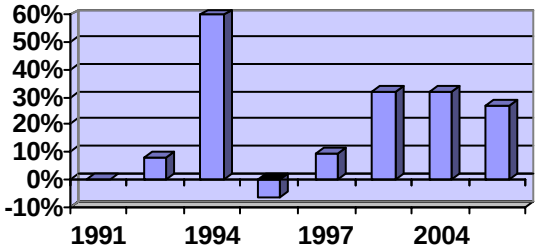
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1991



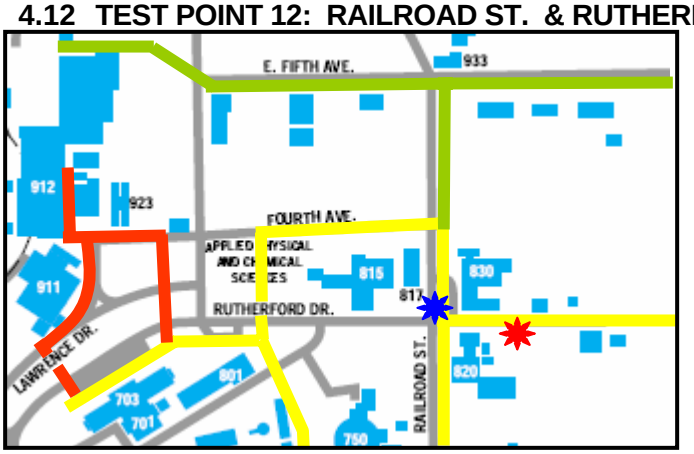
DESCRIPTION

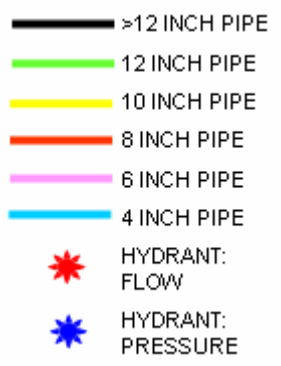
The pressure hydrant was H113 and the flow hydrant H114. The nearest water supply source (Water Treatment Facility) is about 3,000 feet away. The local mains are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1989 and is over 60 years old. The piping is Transite Cement Lined. . .

ANALYSIS

Static pressures have remained relatively consistent (~64 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
For Analysis we have eliminated 2003 test results because the results are twice the average flow over the last 15 years. The average available flow is now about 6,600 GPM. Average flow rate from 1991 has increased by up to 11%. This flow rate increase can be explained by changes in day to day water demands.
Occupancy is rated "High Hazard" due to large fire loads (HFBR, CFN studies and wood roof in building 480).
Piping Condition is rated "Good" due to an increase in available flow by 11% in the last 14 years.
Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.12 TEST POINT 12: RAILROAD ST. & RUTHERFORD AVE.

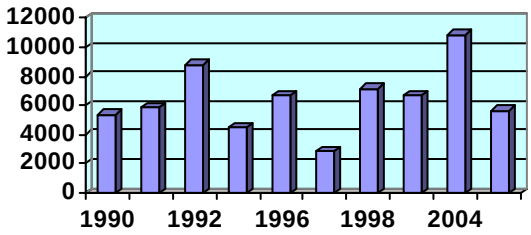




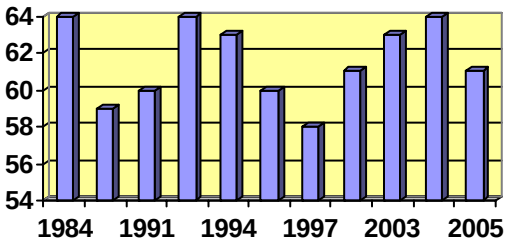
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	61.6 PSI	61.2 PSI	62.7 PSI
FLOW AVERAGE @ 20 PSI	5958 GPM	5809 GPM	6154 GPM
FLOW CHANGE FROM OVERALL	-	-2.6%	3.2%

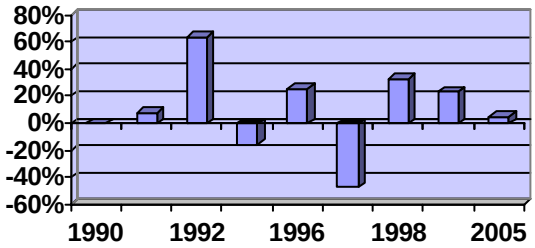
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



DESCRIPTION

The pressure hydrant was H141 and the flow hydrant H138. The nearest water supply source (Well 10) is about 1,200 feet away. The local mains are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is about 50 years old. The piping is Transite Cement Lined and may consist of other unidentified materials.

ANALYSIS

Static pressures have remained relatively consistent (~61 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

For Analysis we have eliminated 2004 test results because the results are almost twice the average flow over the last 15 years. The average available flow is now about 6,100 GPM. Average flow rate from 1990 has increased by up to 3.2%. This flow rate increase cannot be explained by apparent changes in either piping condition or day to day water demands

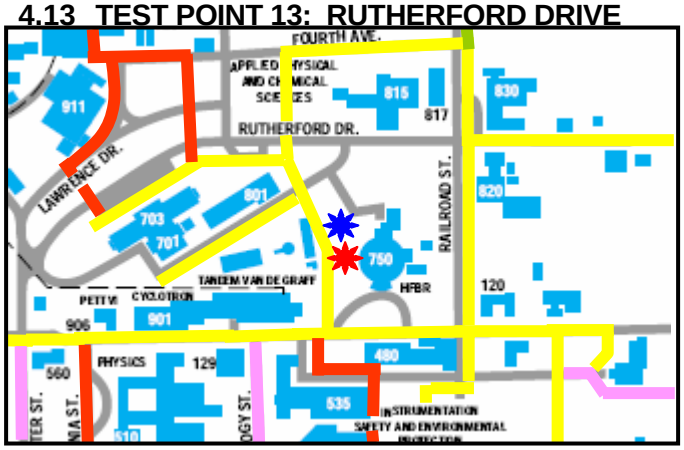
Occupancy is rated "High Hazard" due to large fire loads (Flammable liquid storage in chemical labs in building 815, hot cells in Building 830).

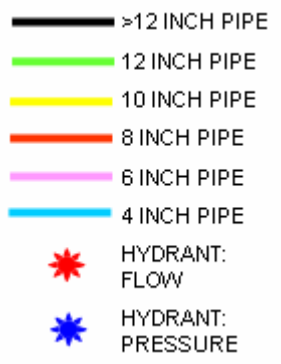
Piping Condition is rated "Good" due to an increase in available flow by 15% in the last 15 years.

Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.13 TEST POINT 13: RUTHERFORD DRIVE

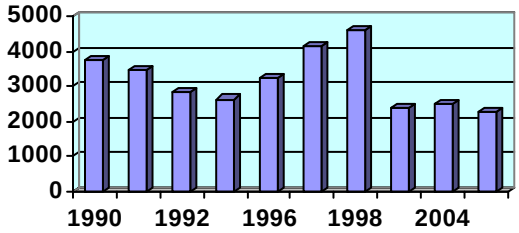




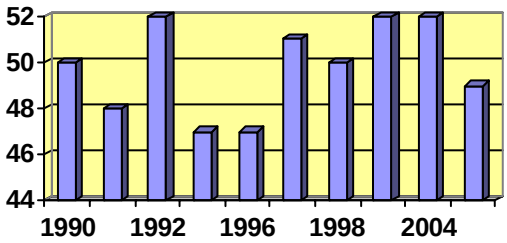
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	FAIR	LIMITED	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	49.8 PSI	50.2 PSI	51.0 PSI
FLOW AVERAGE @ 20 PSI	2396 GPM	NA	2396 GPM
FLOW CHANGE FROM OVERALL	-	-	NA

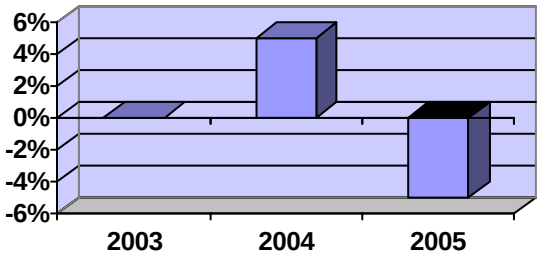
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



DESCRIPTION

The pressure hydrant was H144 and the flow hydrant H247. The nearest water supply source (Well 10) is about 2,200 feet away. The local loop mains are 10 inch. The piping in this area was originally fed from four directions. One feed was eliminated when building 906 was built in the 1980's. The second feed, under building 912, was closed in January 2002 due to activation concerns of the potable water by beam lines. The piping is Cast Iron and may consist of other unidentified materials.

ANALYSIS

Static pressures have remained relatively consistent (~50 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

Flow analysis is based on the tests starting on 2003 since the piping network was altered as late as 2002. The average available flow is now about 2,400 GPM. Average flow rate from 1990 has decreased by up to 33%. This flow rate decrease can be explained by pipe material. The water model supports the lower flow rates results of the last three years

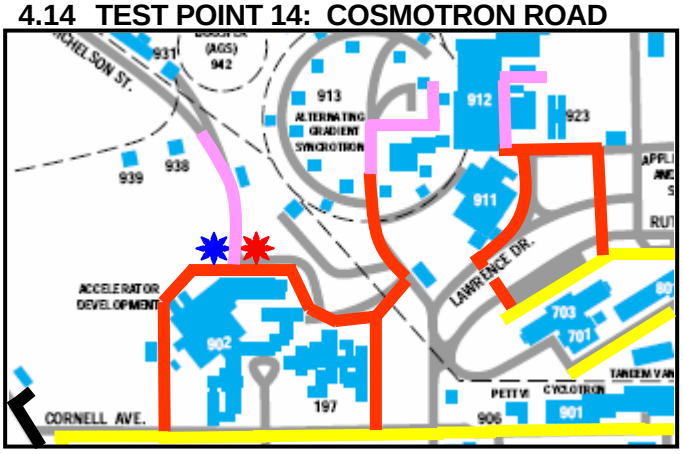
Occupancy is rated "High Hazard" due to large fire loads (HFBR).

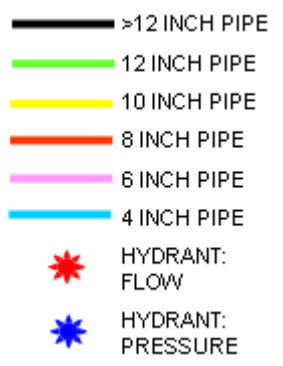
Piping Condition is rated "Fair" due to type of material in the area.

Flow Capacity is rated as "Limited" because of the flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated "Multiple Path" since can easily get water from multiple sources around the site.

4.14 TEST POINT 14: COSMOTRON ROAD

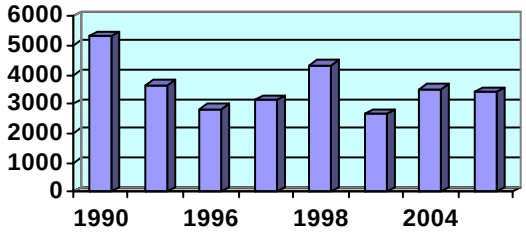




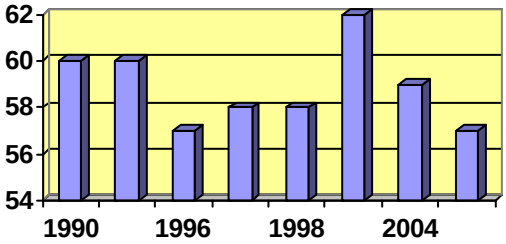
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	59.0 PSI	58.5 PSI	59.3 PSI
FLOW AVERAGE @ 20 PSI	3600 GPM	3305 GPM	3191 GPM
FLOW CHANGE FROM OVERALL	-	-8.9%	-12.8%

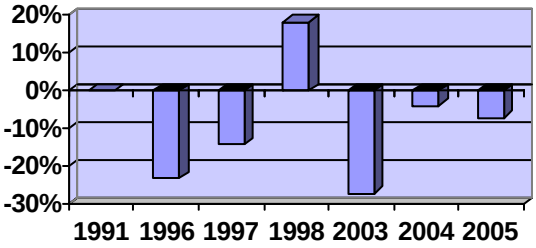
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1991



DESCRIPTION

The pressure hydrant was H043 and the flow hydrant H205. The nearest water supply source (Water Treatment Facility) is about 3,900 feet away. The local loop mains are 8 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is about 40 years old. The piping in this area is Transite Cement Lined and may consist of other unidentified materials.

ANALYSIS

Static pressures have remained relatively consistent (~59 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

The average available flow is now about 3,200 GPM. In individual years the flow peaked in 1990 and has diminished steadily down since then. Average flow rate from 1990 has decreased by up to 12%. However this fact is misleading. The hydraulic flow model validates the current flow results while the results from earlier years are far from normal. The model is using a roughness factor that is close to a new pipe portfolio.

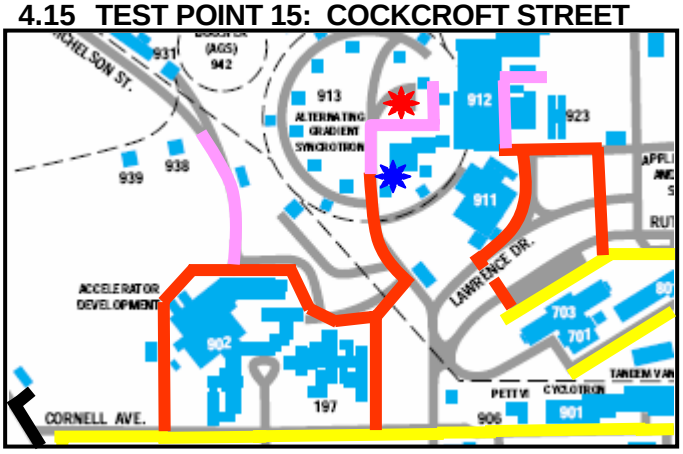
Occupancy is rated “High Hazard” due to large fire loads (combustible roof on building 902).

Piping Condition is rated “Good” due to the recent flow trend is similar to a new pipe..

Flow Capacity is rated as “Good” because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated “Multiple Path” since can easily get water from multiple sources around the site.

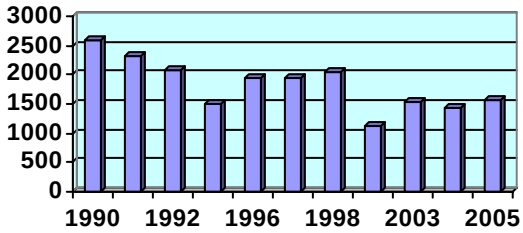
4.15 TEST POINT 15: COCKCROFT STREET



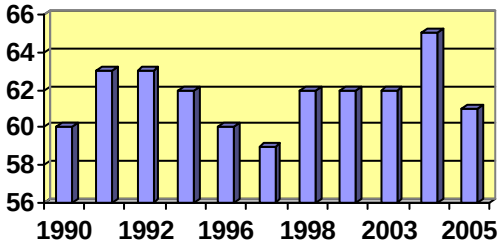
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	GOOD	POOR	DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	61.8 PSI	61.9 PSI	63.0 PSI
FLOW AVERAGE @ 20 PSI	1824 GPM	1605 GPM	1506 GPM
FLOW CHANGE FROM OVERALL	-	NA	NA

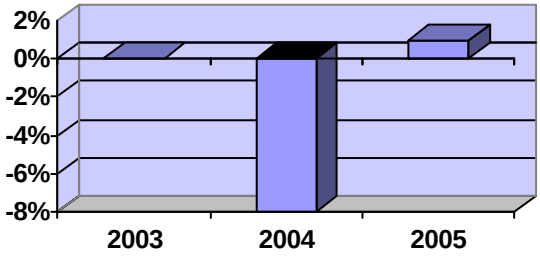
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 2003



DESCRIPTION

The pressure hydrant was H166 and the flow hydrant H168. The nearest water supply source (Water Treatment Facility) is about 3,900 feet away. The dead end main is 6 inch. The piping in this area was a 6 inch loop main that went under building 912 due to activation concerns of the potable water by beam lines in building 912. Main was closed in January 2002. The piping is about 40 years old. The piping is Transite Cement Lined and may consist of other unidentified pipe types.

ANALYSIS

Static pressures have remained relatively consistent (~62 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. These constant static pressure readings cannot be explained by apparent changes in either piping condition or day to day water demands. Further investigation by means of a hydraulic flow model study is required to understand the trend.

When the looped 6 inch main was made into two dead end mains the relevant flow and pressure tests prior to 2003 were eliminated. The current flow average is 1,500 GPM. This average is consistent with the water model results which uses a pipe roughness factor close to a new pipe.

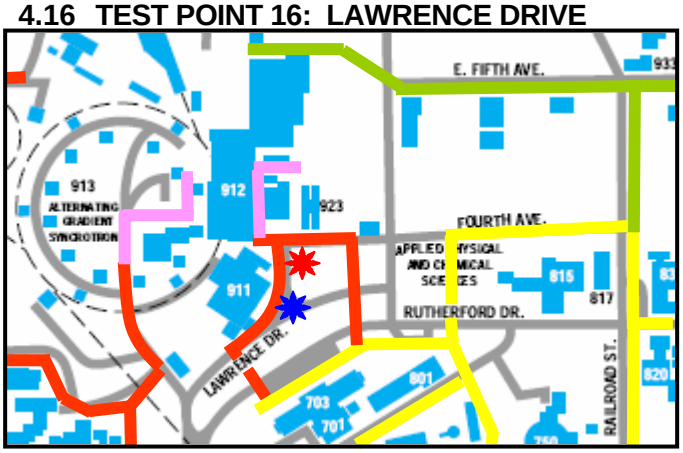
Occupancy is rated "High Hazard" due to large fire loads (cable trays in building 912, wood frame support buildings).

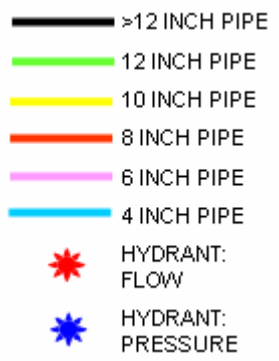
Piping Condition is rated "Good" since water model has similar results and it is using a pipe roughness factor is close to a new pipe,

Flow Capacity is rated as "Poor" because of the limited flow rate compared to the MEFF requirement.

Piping Network of water supplies is rated "Dead End" since this area can only get water via the small dead end pipe to the water sources.

4.16 TEST POINT 16: LAWRENCE DRIVE

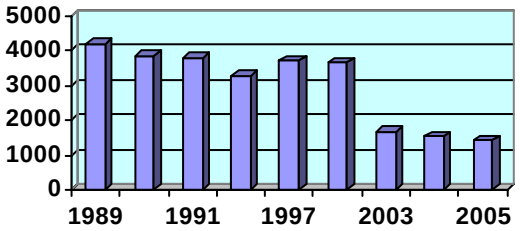




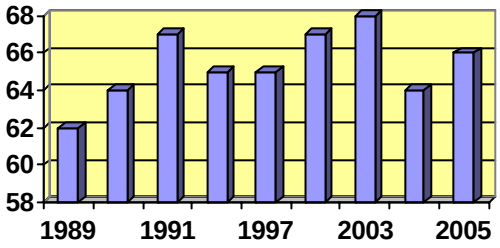
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	POOR	POOR	DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	65.3 PSI	65.8 PSI	66.0 PSI
FLOW AVERAGE @ 20 PSI	NA	NA	1531 GPM
FLOW CHANGE FROM OVERALL	-	--	NA

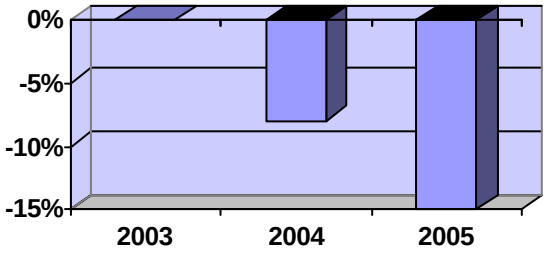
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 2003



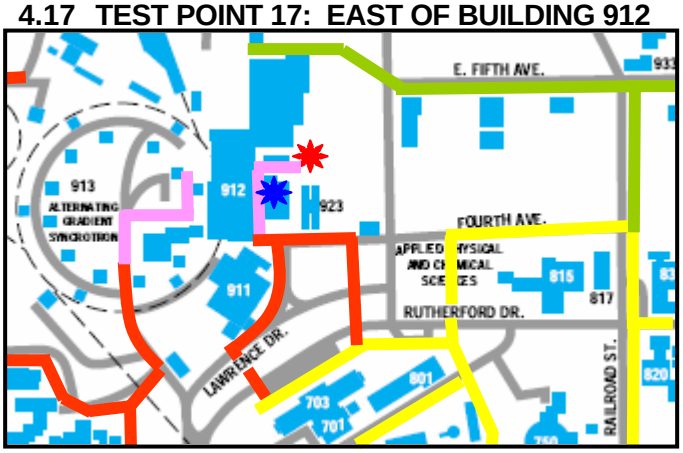
DESCRIPTION

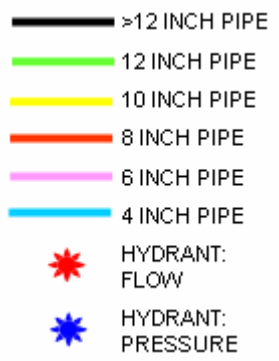
The pressure hydrant was H192 and the flow hydrant H164. The nearest water supply source (Well 10) is about 2,800 feet away. The local loop mains are 8 inch. The piping in this area was originally fed from three directions. One feed was eliminated when building 906 was built in the 1980's. The second feed, under building 912, was closed in January 2002 due to activation concerns of the potable water by beam lines. The piping is Transite Cement Lined, Cast Iron and may consist of other unidentified materials.

ANALYSIS

Static pressures have remained relatively consistent (~66 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
Flow rate analysis is based on tests since 2003 since the piping was modified in the area at that time. The average available flow is now about 1,500 GPM. Average flow rate from 2003 has decreased by 15%. This flow rate loss can be attributed to the age, size and configuration of the piping.
Occupancy is rated "High Hazard" due to large fire loads (AGS warehouses, multistory buildings).
Piping Condition rated "Poor" since the flow trend is losing capacity at roughly 15% over the last 3 years.
Flow Capacity is rated as "Poor" because of the limited flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Dead End" concern since this area can only get water via the single length of pipe to the water sources.

4.17 TEST POINT 17: EAST OF BUILDING 912

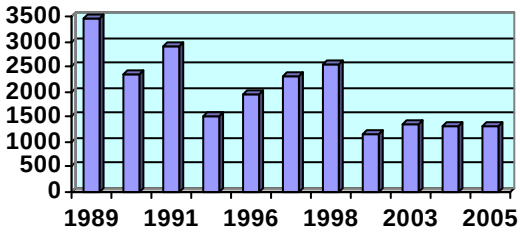




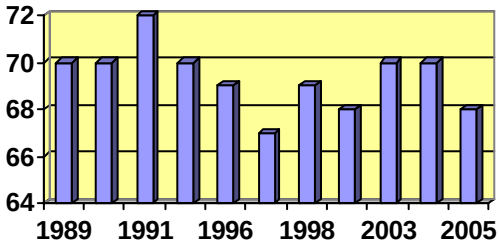
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	POOR	POOR	DEAD END

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	69.4 PSI	68.7 PSI	69.3 PSI
FLOW AVERAGE @ 20 PSI	NA	NA	1310 GPM
FLOW CHANGE FROM OVERALL	-	-	NA

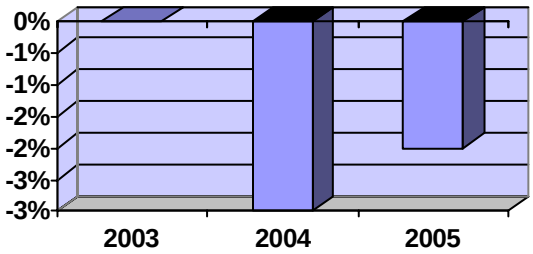
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 2003



DESCRIPTION

The pressure hydrant was H167 and the flow hydrant H193. The nearest water supply source (Well 10) is about 3,400 feet away. The dead end main is 6 inch. The piping in this area was a 6 inch loop main that went under building 912 due to activation concerns of the potable water by beam lines in building 912. Main was closed in January 2002. The piping is about 40 years old. The piping is Transite Cement Lined and may consist of other unidentified materials.

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ANALYSIS

Static pressures have remained relatively consistent (~69 PSI). These constant static pressure readings cannot be explained by apparent changes in either piping condition or day to day water demands. Further investigation by means of a hydraulic flow model study is required to understand the trend.

Flow rate analysis is based on tests since 2003 since the piping was modified in the area at that time. The average available flow is now about 1,300 GPM. Average flow rate from 2003 has remained relatively flat. The low flow rate loss can be attributed to the age, size and configuration of the piping.

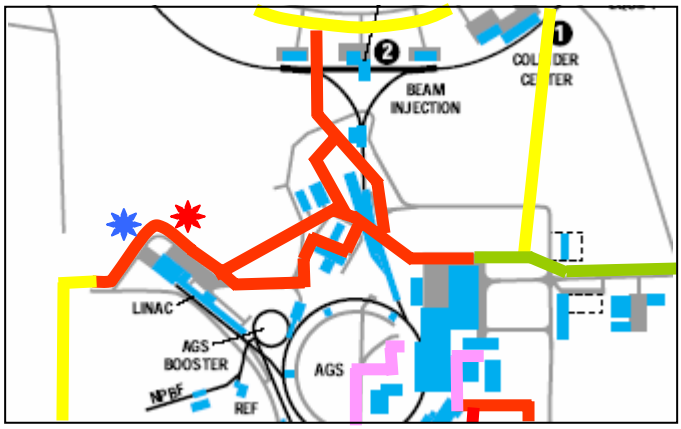
Occupancy is rated "High Hazard" due to large fire loads (target halls for AGS, large AGS buildings).

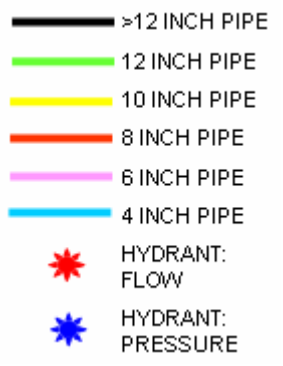
Piping Condition rated "Poor" since the flow trend is losing capacity at roughly 2% over the last 3 years.

Flow Capacity is rated as "Poor" because of the limited flow rate at current piping conditions.

Piping Network of water supplies is rated "Dead End" since this area can only get water via the small dead end pipe to the water sources.

4.18 TEST POINT 18: WEST FIFTH AVENUE

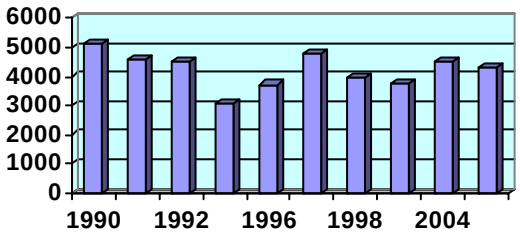




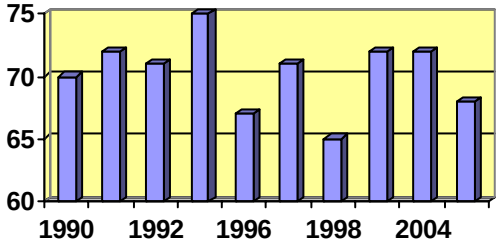
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	ORDINARY HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	70.3 PSI	69.2 PSI	70.7 PSI
FLOW AVERAGE @ 20 PSI	4229 GPM	4173 GPM	4191 GPM
FLOW CHANGE FROM OVERALL	-	-1.3%	-0.9%

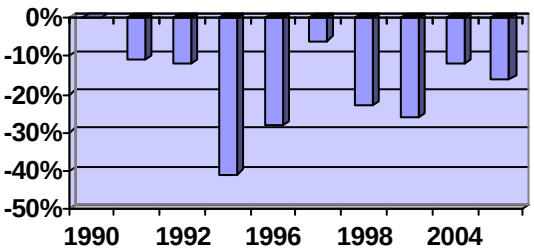
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



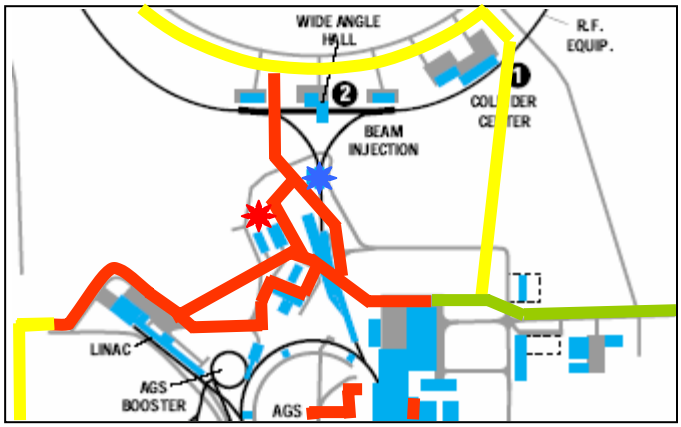
DESCRIPTION

The pressure hydrant was H202 and the flow hydrant H201. The nearest water supply source (Water Treatment Facility) is about 2,500 feet away. The local loop mains are 8 inch while the feed from the Water Treatment Facility is 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is about 40 years old. The piping is Transite Cement Lined and Black Steel.

ANALYSIS

Static pressures have remained relatively consistent (~69 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is now about 4,200 GPM. Average flow rate from 1990 has remained relatively flat.
Occupancy is rated "Ordinary Hazard" due to non combustible buildings with combustible contents, cable trays.
Piping Condition is rated "Good" due to a decrease in available flow less than 2% in the last 15 years.
Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since this area can easily get water from multiple sources around the site.

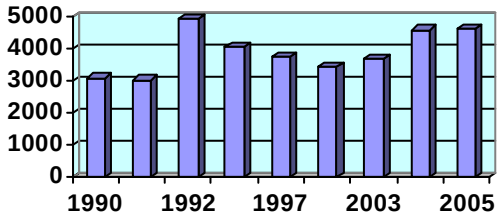
4.19 TEST POINT 19: THOMPSON AVENUE



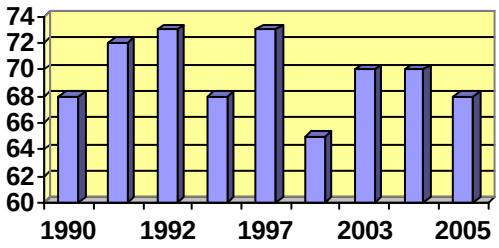
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	ORDINARY HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	69.7 PSI	69.0 PSI	69.3 PSI
FLOW AVERAGE @ 20 PSI	3921 GPM	4036 GPM	4311 GPM
FLOW CHANGE FROM OVERALL	-	2.9%	9.1%

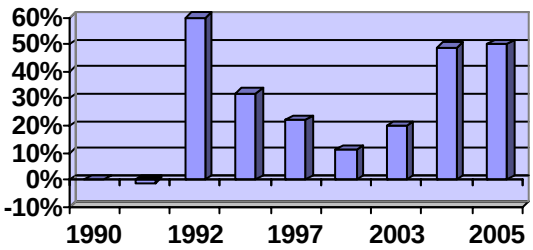
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



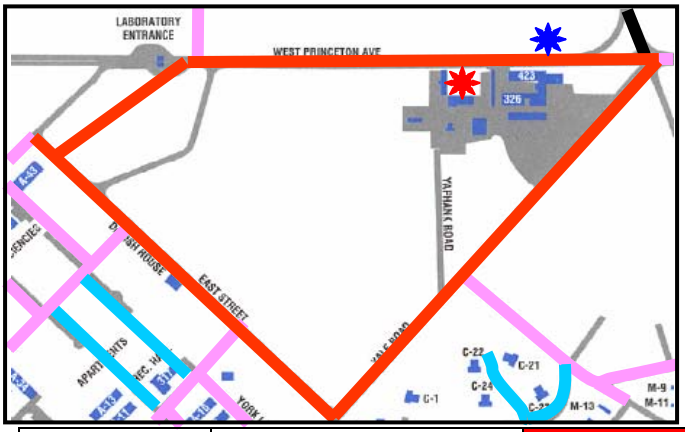
DESCRIPTION

The pressure hydrant was H234 and the flow hydrant H211. The nearest water supply source (Well 10) is about 2,600 feet away. The local mains are 8 inch. The piping has not been altered since the first relevant flow test in 1990 and is about 40 years old. The piping is Transite Cement Lined and Cast Iron.

ANALYSIS

Static pressures have remained relatively consistent (~68 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is now about 4,300 GPM. Average flow rate from 1990 has increased by 9%. This flow rate gain can be attributed to the decrease of water demand by experiments in the area..
Occupancy is rated "Ordinary Hazard" due to non combustible buildings with combustible contents.
Piping Condition is rated "Good" due to a increase in available flow of 9% in the last 15 years.
Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since this area can easily get water from multiple sources around the site.

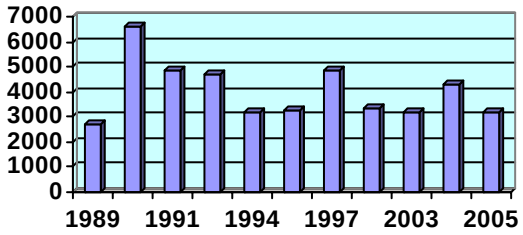
4.20 TEST POINT 20: WEST PRINCETON AVENUE



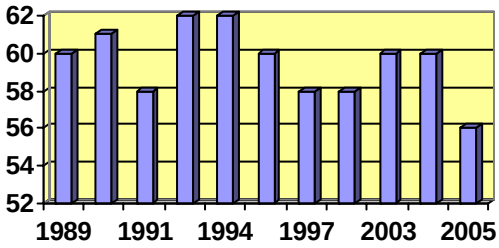
MEFF 3,000 GPM	OCCUPANCY ORDINARY HAZARD	PIPING CONDITION POOR	FLOW CAPACITY GOOD	PIPING NETWORK MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	59.5 PSI	58.7 PSI	58.7 PSI
FLOW AVERAGE @ 20 PSI	4014 GPM	3695 GPM	3564 GPM
FLOW CHANGE FROM OVERALL	-	-8.6%	-12.6%

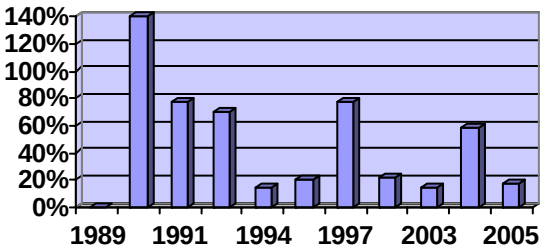
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1989



DESCRIPTION

The pressure hydrant was H027 and the flow hydrant H026. The nearest water supply source (300K Tank) is about 1,600 feet away. The local loop mains are 8 inch. The piping in this area has not been altered since the first relevant flow test in 1989 and is over 60 years old. The piping is Transite Cement Lined.

ANALYSIS

Static pressures have remained relatively consistent (~59 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
The average available flow is now about 3.500 GPM. Average flow rate from 1989 has decreased by 12%. This flow rate loss can be attributed to the age and size of the piping.
Occupancy is rated "Ordinary Hazard" due to the wood frame buildings with flammable liquids, but low importance to BNL programs.
Piping Condition is rated "Poor" due to a decrease in available flow by 12% in the last 16 years.
Flow Capacity is rated as "Good" because of the limited flow at current demand loading through the main piping network.
Piping Network of the water supplies is rated "Multiple Path" since this area can easily get water from multiple sources around the site.
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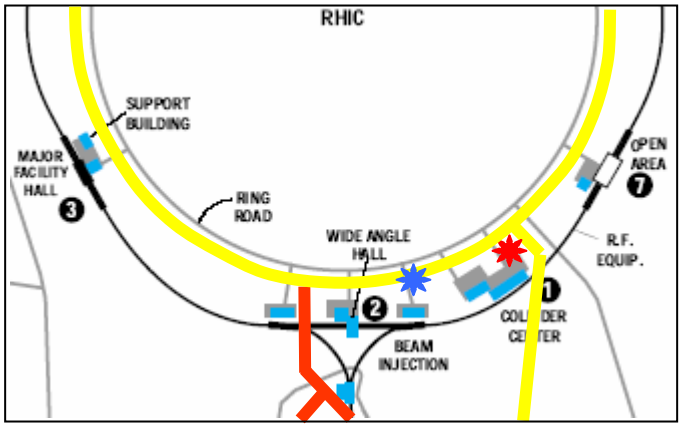
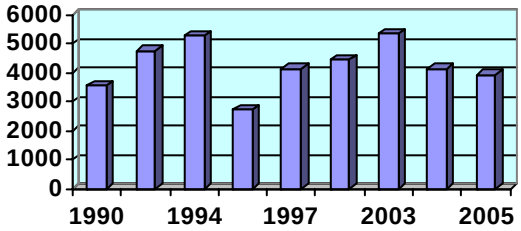
4.21 TEST POINT 21: RHIC RING – EAST FEEDER



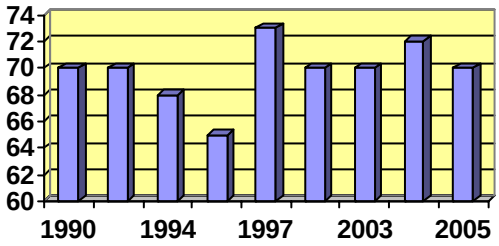
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	ORDINARY HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	69.8 PSI	70.0 PSI	70.7 PSI
FLOW AVERAGE @ 20 PSI	4247 GPM	4111 GPM	4460 GPM
FLOW CHANGE FROM OVERALL	-	-3.3%	4.8%

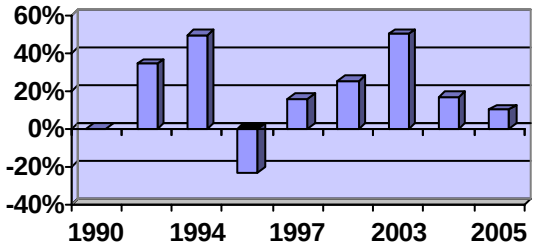
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT FLOW CHANGE FROM 1990



DESCRIPTION

The pressure hydrant was H226 and the flow hydrant H225. The nearest water supply source (Well 10) is about 2.700 feet away. The local loop mains and feeder are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is about 15 years old. The loop piping is Cement Lined Ductile Iron and the feeder is Cast Iron.

ANALYSIS

Static pressures have remained relatively consistent (~70 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.

The average available flow is now about 4,400 GPM. Average flow rate from 1990 has increased by up to 4%. This flow rate increase cannot be explained by apparent changes in either piping condition or day to day water demands.

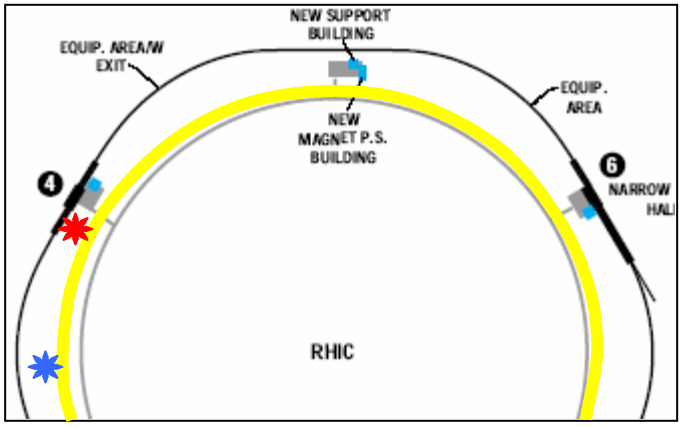
Occupancy is rated “Ordinary Hazard” due to non-combustible facilities with high programmatic contents.

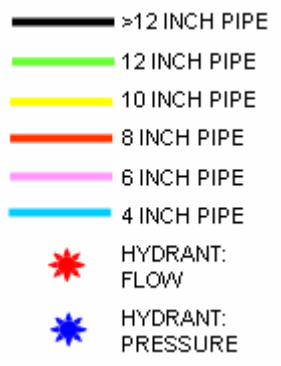
Piping Condition is rated “Good” due to an increase in available flow by 11% in the last 13 years.

Flow Capacity is rated as “Good” because of the ample flow rate at current demand loading through the main piping network.

Piping Network of water supplies is rated “Multiple Path” since all water must enter via the isolated 8 inch loop. The two feeds into the ring has to be investigated by hydraulic modeling to see if can support the area by themselves.

4.22 TEST POINT 22: RHIC RING

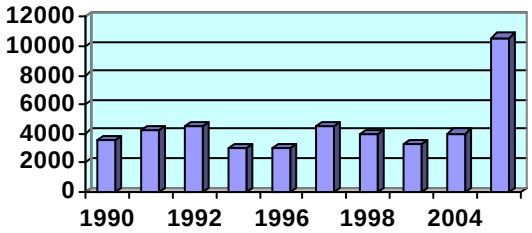




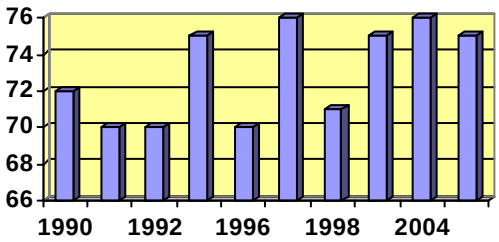
MEFF	OCCUPANCY	PIPING CONDITION	FLOW CAPACITY	PIPING NETWORK
2,500 GPM	HIGH HAZARD	GOOD	GOOD	MULTIPLE PATH

SUMMARY TABLE	OVERALL	10 YEAR	5 YEAR
STATIC PRESSURE AVERAGE	73.0 PSI	73.8 PSI	75.3 PSI
FLOW AVERAGE @ 20 PSI	3750 GPM	3716 GPM	3616 GPM
FLOW CHANGE FROM OVERALL	-	-0.9%	-3.7%

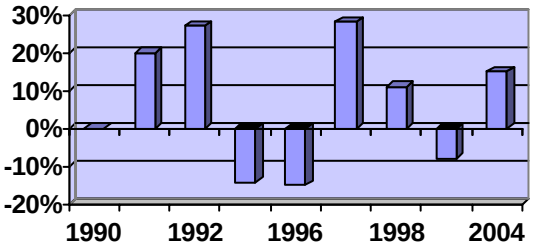
CALCULATED FLOW AT 20 PSI (GPM)



STATIC PRESSURE (PSI)



PERCENT CHANGE FROM BASE



DESCRIPTION

The pressure hydrant was H230 and the flow hydrant H219. The nearest water supply source (Well 10) is about 5,000 feet away. The local loop mains are 10 inch. The piping in this area has not been altered since the first relevant flow test in 1990 and is about 20 years old. The piping is Cement Lined Ductile Iron. . .

ANALYSIS

Static pressures have remained relatively consistent (~68 PSI.) The consistent readings can be attributed the large diameter grid supply piping network. It appears that that overall site wide water demand changes have no major effect on the water supply in this area.
Flow test from 2005 is not included in the flow analysis since the flow was double the next largest calculated flow. The average available flow is now about 3,600 GPM. Average flow rate from 1990 has decreased by 3%. This flow rate decrease can be explained by apparent changes in day to day water demands.
Occupancy is rated "High Hazard" due to the densely populated wood frame construction buildings.
Piping Condition is rated "Good" due the available flow has been relatively stable in the last 15 years.
Flow Capacity is rated as "Good" because of the ample flow rate at current demand loading through the main piping network.
Piping Network of water supplies is rated "Multiple Path" since all water must enter via the isolated 8 inch loop. The two feeds into the ring has to be investigated by hydraulic modeling to see if can support the area by themselves